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## PRESSURE-SENSITIVE ADHESIVE SHEET

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[There are no amendments to this patent.]

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### Claims

1. A pressure-sensitive adhesive sheet consisting of a substrate, several hollow projections formed with thin films that can be broken by pressure applied when adhering to the substrate, and an adhesive component sealed in the hollow projections.

2. A pressure-sensitive adhesive sheet described in Claim 1 characterized by consisting of a substrate which is also used to be adhered.

3. A pressure-sensitive adhesive sheet described in Claim 1 characterized by using a single pressure-sensitive adhesive component.

4. A pressure-sensitive adhesive sheet described in Claim 1 characterized by using a two-liquid solvent reactivating type adhesive component.

5. A pressure-sensitive adhesive sheet described in Claim 1 characterized by using a two-liquid reaction type adhesive component.

6. A pressure-sensitive adhesive sheet described in Claim 1 characterized by consisting of hollow projections having double structures and a two-liquid reactive type adhesive component.

## Detailed explanation of the invention

### Industrial application field

The present invention is concerned with a pressure-sensitive adhesive sheet used for interior such as a wallpaper or a decoration and also used for adhesion in a synthetic resin sheet to the inner wall of an oil tank in a tanker.

### Prior art

Either an adhesive was previously applied on either a wallpaper or a wall for coating, then the wallpaper was adhered to the wall from one end toward another end as part of interior work for a building. In the case of requiring strong adhesivity, a two-liquid type of adhesive was used by mixing two types of liquid to perform curing. A microcapsule type of adhesive was also used.

### Problems to be solved by the invention

It required many attempts to prevent air from being present between a paper and a wall during adhesion. A strong adhesive was quickly hardened in air. In the case of a two-liquid type, it was quickly hardened after mixing. So, it could not be used for adhesion to a large surface area. In the case of a microcapsule type, because it was expensive to make, and because it might not be stable for a long time, it was difficult for use in coating.

## Means to solve the problems

Hollow projections 3a was made with thin films 3 on the surface of substrate 2, then adhesive component 4 was sealed in the hollow projections. Substrate 2 may be previously adhered to an adhesive material such as a wallpaper, or a wallpaper may be used as a substrate so that hollow projections 3a may be formed on it. Hollow projections 3a may be formed on both surfaces of substrate 2, then adhesive component 4 may be sealed in the projections. Examples of adhesive component include a single-component pressure-sensitive adhesion type, two-liquid solvent reactivation type, and reaction type.

Thin film 3 must be able to be broken by pressure when adhesion is performed.

## Function

In the case of adhering an adhesive material (wallpaper P) to another material (wall W), when the material is pressed against the edge of the other adhesive material, adhesion component 4 sealed in hollow projections 3a is released, then the adhesive material is firmly adhered to the other material. The adhesive component may be reactivated using a solvent or a hardening reaction may be performed by mixing a two-liquid [adhesive].

## Application examples

In Figure 1, pressure-sensitive adhesive sheet 1 is previously adhered to the bottom surface of wallpaper P. Several hollow projections 3a are formed with thin films 3 on the entire surface of substrate 2 in the case of sheet 1. Adhesive component 4 is sealed in hollow projections 3a. Various types of substrate can be used for substrate 2 including metal, plastic, ceramic, wood, straight, and film. Both thickness and hardness depend on the type of material to be adhered. Examples of material of thin film 3 include the following, i.e., natural or synthetic polymer able to form films such as gelatin, gum arabic, vinylidene polychloride, epoxy resin, polyester, polystyrene, polyethylene, polypropylene, polyamide, metal foil, or glass film. However, thin film 3 must be neither dissolved in adhesive component 4 or reactive to adhesive component 4. Thin film 3 must be easily broken by pressing and so thickness of thin film 3 is suitably 1-100 microns. Thin film 3 having the thickness of 1-20 microns is desirably flexible and stretching.

Examples of adhesive component 4 include the following pressure-sensitive adhesives, i.e., polyisobutylene; polyvinyl ether; polysiloxane; reclaimed rubber; SBR; butyl rubber; polychloroprene; nitrile rubber; polysulfide; and cyanoacrylate.

In the case of adhering wallpaper P to the surface of wall W, when the end of wallpaper P is pressed against the end of the surface of wall W, thin film 3 is broken, included adhesive component 4 is released, then wallpaper P is adhered to the surface of wall W.

Figure 2 shows an application example in which wallpaper P is used as substrate 2 of pressure-sensitive adhesive sheet 1. Except for this example, other structures are the same as those shown in Figure 1. Wallpaper P is used as substrate 2 in application examples shown in Figures 3-5. Since hollow projections are formed with thin films on the wallpaper, a wallpaper also means a substrate.

Figure 3 shows another application example in which a solvent reactivation type is used as pressure-sensitive adhesive sheet 1. Examples of an adhesive component organic solvent 4a such as hexane, include the following: heptane, benzene, xylene, toluene, carbon tetrachloride, trichloroethylene, MEK, MIBK, ethylcellosolve, methyl cellosolve, butyl Cellosolve, or ethyl acetate, was contained in hollow projections 3a. Another adhesive component 4b such as neoprene, nitrile rubber, natural rubber, reclaimed rubber, other vinyl acetate homopolymers or copolymers, vinyl resin, or nitrocellulose, is applied on the outer surfaces of hollow projections 3a for coating, and parting papers (not shown) are temporarily adhered to protect the surfaces.

When sheet 1 is used, parting papers are peeled, wallpaper P is pressed against wall W using a pressing roll, so hollow projections are broken, organic solvent is released, neoprene used for coating is reactivated, then adhesion is completed.

Figure 4 shows another application example for a reactive sheet.

Resin 4a is sealed as an adhesive component in selected hollow projections 3a, and other adhesive components including a hardener, a catalyst, and reaction initiator 4b are sealed in other hollow projections. Examples of resin include the following: epoxy, polyether, polyamide, polyester, silicone,



polysulfide, polyol, and isocyanate. Examples of hardener include the following: stannous caprylate, tin dibutyl dilaurate, BF<sub>3</sub> ether complex compound, phthalic acid anhydride, trimellitic acid anhydride, p-cyanobenzoic acid, acid chloride, organic peroxide, zinc oxide, magnesium oxide, lead dioxide, manganese dioxide, diethylene triamine, triethylene diamine, triethylene tetramine, tetraethylene pentamine, hexamethylene tertramine, ethylene diamine, metaphenylene diamine, triethanol amine, diethyl aniline, methylene dianiline, dimethyl-p-toluidine, piperidine, 2-ethyl-4-methyl imidazole, N,N,N',N'-tetrakis (2-oxypropyl) ethylene diamine, and isocyanate.

When hollow projections made with thin films are broken using a pressing roll, resin 4a is mixed with 4b such as a hardener, and so hardening reaction can be performed.

Figure 5 shows adhesive sheet 1 which is the same type as that shown in Figure 4. Hollow projections made with thin films have double structures. Resin 4a is sealed in one, and hardener 4b is sealed in the other one.

#### Effect of the invention

Because hollow projections located in an adhesion area are broken to release adhesive components, adhesion can be performed on a large surface area such as a sheet adhesion. There is no time restriction. Since air between an adhesive material and another material can be easily released through each space between the projections, no air remains. So, adhesion can be easily and quickly performed, and beautiful finish can result.

# Brief explanation of the figures

Figures 1 through 5 are cross sections showing application examples of the present invention.

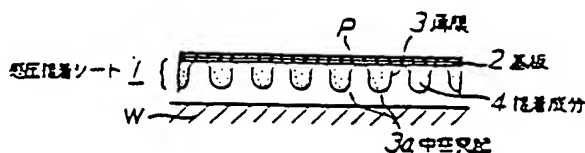


Figure 1

- Key: 1 Pressure-sensitive adhesive sheet  
 2 Substrate  
 3 Thin film  
 3a Hollow projection  
 4 Adhesive component

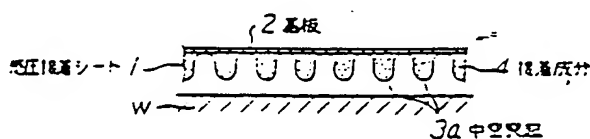


Figure 2

- Key: 1 Pressure-sensitive adhesive sheet  
 2 Substrate  
 3 Thin film  
 3a Hollow projection  
 4 Adhesive component

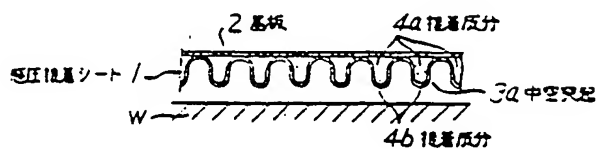


Figure 3

- Key: 1 Pressure-sensitive adhesive sheet  
 2 Substrate  
 3 Thin film  
 3a Hollow projection  
 4a, b Adhesive component

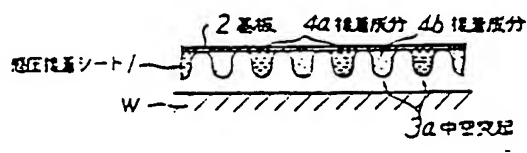


Figure 4

- Key: 1 Pressure-sensitive adhesive sheet  
 2 Substrate  
 3 Thin film  
 3a Hollow projection  
 4a, b Adhesive component

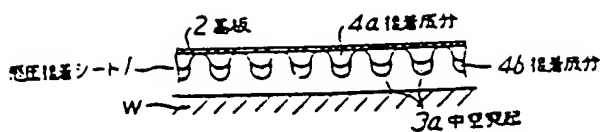


Figure 5

- Key: 1      Pressure-sensitive adhesive sheet  
 2      Substrate  
 3      Thin film  
 3a      Hollow projection  
 4a, b      Adhesive component